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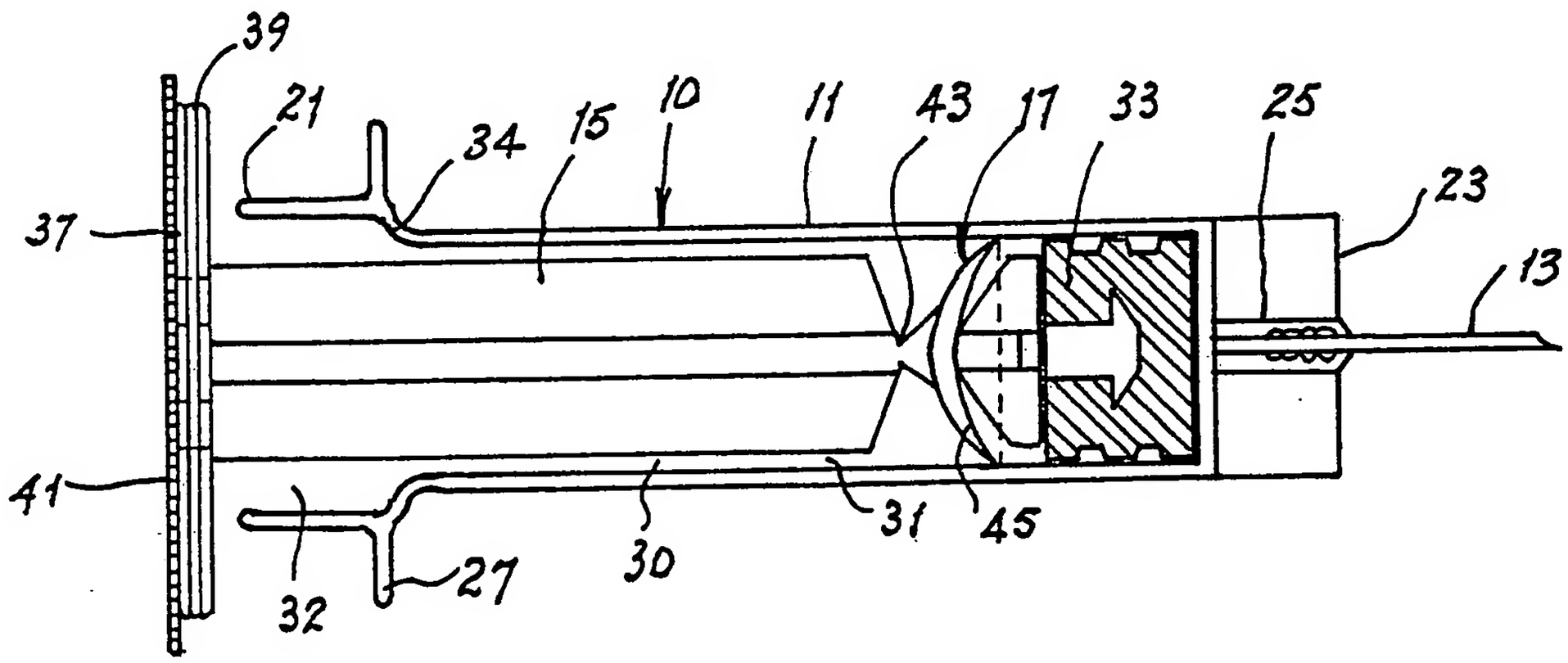

(57) Abstract

A syringe intended for use only once and then disposed. The syringe comprises a barrel (11) and a plunger (15) slidably and sealingly mounted in the barrel. A control means (17) provided on the plunger co-operates with the barrel to permit movement of the plunger along the barrel in one direction while resisting movement in the reverse direction thereby to present further use. More particularly, the control means (17) includes a portion (45) which is arranged to brush against the barrel upon movement of the plunger in one direction to permit such movement and which is arranged to bite against said barrel upon attemptive movement of the plunger in the reverse direction thereby to resist such movement.

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SINGLE USE SYRINGE

THIS INVENTION relates to a syringe.

Throughout the specification, the term "syringe" shall be taken to include hypodermic syringes and other devices having a needle for injecting a fluid into, or removing a fluid from, the body of a patient.

There is concern about the transmission of infectious diseases by contaminated needles through the re-use of syringes. A syringe which can be used only once would obviously be of assistance in combating this problem.

The present invention seeks to provide a syringe which can be used only once and is thereafter effectively inoperable.

In one form the invention resides in a syringe comprising a barrel, a plunger slidably and sealingly mounted in the barrel and a control means provided on the plunger and co-operating with the barrel to permit movement of the plunger along the barrel in one direction while resisting movement in the reverse direction.

Preferably the control means includes a portion which is arranged to brush against the barrel upon movement of the plunger in one direction to permit such movement and which is arranged to bite against said barrel upon attempted movement of the plunger in the reverse direction thereby to resist such movement.

Preferably the control means comprises a body mounted on the plunger and extending outwardly and axially whereby

the outermost portion of the body faces in the direction in which movement of the plunger is resisted.

Preferably at least said outermost portion of the body is resiliently flexible and is arranged for elastic expansion in a radial direction for pressing engagement with said barrel. Conveniently, substantially the whole of said body is resiliently flexible.

Preferably the plunger has a weakened section which is adapted to fracture when excessive force is applied to the plunger in an attempt to overcome said resistance to movement.

Preferably, said control means is received in a bore within said barrel and the outer portion of the body engages the circumference of said bore. Preferably said bore is the bore in the barrel in which the plunger is slidably and sealingly received.

Preferably the body is configured in the form of a cup when in said bore.

In another form the invention resides in a syringe comprising a barrel, a plunger slidably and sealingly mounted in the barrel and control means provided on the plunger and co-operating with the barrel, the control means having first and second modes of operation wherein in said first mode the control means permits movement of the plunger along the barrel in a first direction while resisting movement in a second direction and wherein in said second mode the control means permits movement of the plunger along the barrel in said second direction while resisting movement in said first direction.

Preferably, the control means includes a portion which is arranged to bite against the barrel when providing resistance to movement of the plunger along the barrel and to brush along the barrel when permitting movement of the plunger.

Preferably, said control means co-operates with a bore provided in the barrel. Preferably, said bore is the bore in the barrel in which the piston of the plunger is received.

Preferably the control means comprises a body mounted on the plunger and having an outer portion arranged for pressing engagement with the barrel, the body being arranged for and capable of selective movement between a first position corresponding to the first mode of operation of the control means in which the body extends towards a first end of the plunger and a second position corresponding to the second mode of operation of the control means in which the body extends towards a second end of the plunger.

Preferably the body comprises a disc of resiliently flexible material, said disc being of larger diameter than the diameter of the bore whereby the disc is deformed when in the bore to assume a cup-like configuration.

Preferably said body is so positioned on the plunger as to move outside the confines of the bore when the plunger is fully retracted thereby to no longer be subjected to deformation by the bore.

Preferably, the end of the bore through which the body moves into and out of the bore presents an abutment for engagement by the body as it enters the bore thereby to

effect deformation of the body, said deformation being such that the outer side of the body is at the trailing end of the body as it moves inwardly along the barrel with the plunger.

Preferably said plunger includes a weakened section which is adapted to fracture when excessive force is applied to the plungers in an attempt to overcome said resistance to movement.

Preferably, the plunger comprises a piston and a shank extending outwardly of the barrel, said control means being mounted on the shank and said weakened section being provided between the free end of the shank and the control means.

The invention will be better understood by reference to the following description of one specific embodiment thereof as shown in the accompanying drawings in which:-

Fig. 1 is a sectional elevational view of a syringe according to the embodiment shown stored in a protective sheath;

Fig. 2 is a sectional elevational view of the syringe shown removed from the sheath in readiness for use and with the control means in a mode which permits retraction of the plunger;

Fig. 3 is a sectional elevational view of the syringe shown with the plunger fully retracted following drawing of fluid into the syringe;

Fig. 4 is a sectional elevational view of the syringe shown during an injection stage with the control means in a position to permit inward movement of the plunger;

Fig. 5 is a sectional elevational view of the syringe shown at the completion of the injection

with the control means in a position to resist subsequent retraction of the plunger; and

Fig. 6 is a sectional elevational view of the syringe shown returned to the protective sheath following use.

The embodiment shown in the drawings is directed to a hypodermic syringe for injecting fluid into the body of a patient. The syringe is intended for single use only and then disposal.

The syringe 10 comprises a barrel 11, a needle 13, a plunger 15 and a control means 17 for controlling movement of the plunger 15 along the barrel 11.

A protective sheath 19 is provided for storing the syringe before and after use. The sheath has an open end 20 which provides access to the interior of the sheath.

The barrel 11 has a proximal end 21 which is open to accommodate the plunger 15 and a distal end 23 at which there is a nozzle 25 for receiving the needle 13. A flange 27 is formed around the barrel adjacent the proximal end 21 to provide a means by which a user can grip the barrel while using the syringe.

The barrel 11 is hollow and has a bore 30 which accommodates the plunger 15. The bore 30 includes a first bore section 31 which is adjacent the nozzle 25 and a second bore section 32 which is adjacent the proximal end 21 of the barrel and which is larger in diameter than the first bore section 31. An annular shoulder 34 is provided at the junction between the first and second bore sections.

The plunger 15 comprises a piston 33 and a shank 35. The piston 33 is received in the bore 30 within the syringe barrel 11 for sliding and sealing engagement with the first bore section 31. The shank 35 is connected to the piston 33 and extends out through the opening at the proximal end 21 of the syringe barrel. The outer end of the shank 35 has a flange 37 to facilitate manual operation of the plunger. The flange 37 is also adapted to close the open end 20 of the sheath 19 when the syringe 10 is received within the sheath. In this connection, the flange 37 is provided with a male thread formation 39 adapted to threadingly engage a corresponding female thread formation provided at the open end 20 of the sheath. The peripheral edge of the flange 37 is provided with knurling 41 to facilitate gripping of the flange as it is screwed onto, or unscrewed from, the sheath 19.

The shank 35 is of a generally cruciform shape in cross-section except for a weakened section 43 at a region along the length of the shank and a hub portion 44 between the weakened section and the piston. The weakened section is of reduced width in relation to the remainder of the shank thereby to provide its weakened condition.

The control means 17 is provided for controlling movement of the plunger 15 along the bore 30. More particularly, the control means is arranged to permit the plunger to be retracted once so as to draw fluid through the needle 13 and into the syringe barrel and thereafter pushed inwardly only once to force the injected fluid along the barrel and out through the needle 13 into the body of the patient.

The control means 17 comprises a disc 45 of resiliently flexible elastomeric material mounted on the hub portion 44 provided on the shank of the plunger. The disc 45 is

of a diameter which is larger than the diameter of the first bore section 31 and smaller than the diameter of the second bore section 32. Because the disc 45 is smaller in diameter than the first bore section 31 it deflects laterally when introduced into the first bore section 31 to assume a cup-like configuration, as shown in the drawings. When confined in the first section 31 of the bore, the resiliently flexible disc 45 frictionally engages the wall of the bore. The outer end of the disc 45 is presented to either the proximal end or the distal end of the barrel, according to the lateral side to which the disc is deflected. With this arrangement, the disc can be moved along the bore section 31 of the barrel in a direction in which the outer end of the disc is at the trailing end of the disc, the disc merely brushing along the side wall of the bore. Where it is attempted to move the disc along the barrel in a direction in which the outer end is at the leading end of the disc, the outer end bites against the side wall of the bore and resists such movement.

The disc 45 is attached to the plunger 15 and moves in unison with the plunger. The disc thus permits the plunger to be moved along the bore of the barrel in a direction in which the outer end of the disc would trail the disc. If, however, there is an attempt to move the plunger in a direction in which the outer end of the disc is at the leading end of the disc, the disc would bite against the side wall of the first bore section and resists such movement.

When the plunger is first inserted into the barrel of the syringe, the disc 45 is positioned such that its outer end is deflected in the direction towards the piston 33, as shown in Figs. 1 and 2 of the drawings.

The disc is positioned on the plunger such that as the plunger approaches the proximal end 21 of the syringe barrel during retraction of the plunger, the disc leaves the first bore section 31 and enters the second bore section 32, as shown in Fig. 3 of the drawings. When the disc is in the second bore section of the syringe barrel, it resumes its undeflected condition. As the disc re-enters the first bore section on inward movement of the plunger, it contacts the shoulder 34 at the junction between the first and second bore sections and is deflected laterally in a direction which is rearward relative to the movement of the plunger, as shown in Fig. 4 of the drawings. Thus it can be seen that the disc is now in a position in which it permits inward movement of the plunger and resists retraction of the plunger.

Operation of the syringe will now be described. Prior to its use, the syringe is maintained in a sterile environment within the protective sheath 19. When required for use, the syringe is removed from the sheath by unscrewing the flange 37 and retracting the syringe from within the protective sheath. As shown in Fig. 2 of the drawings, the syrup is at this stage in readiness for an injection fluid to be drawn into the syringe barrel and it will be noted that the disc 45 is in a position which would permit retraction of the plunger to draw the fluid into the syringe. The plunger is then retracted and as the plunger approaches the end of its outward movement the disc 45 leaves the first bore section 31 and enters the second bore section 32 where it resumes its undeflected state, as shown in Fig. 3 of the drawings. The syringe is at this stage in readiness for injection of the fluid previously drawn into the barrel. The needle 13 is inserted into the body of the patient and the plunger

pushed inwardly thereby to force the injection fluid through the needle 13 and into the body of the patient. As the plunger moves inwardly, the disc contacts the shoulder 34 at the junction between the two bore sections and is deflected rearwardly, as shown in Fig. 4 of the drawings. As the plunger moves along the bore during the injection stage, the disc 45 brushes along the side wall of the first bore section. At the end of the injection stage, the plunger is in the position shown in Fig. 5 of the drawings. Any attempt to retract the piston for a second time is resisted by the disc as it is now in a position in which its outer end faces the proximal end of the syringe barrel. In this position, the disc would bite against the side wall of the barrel attempt to retract the plunger.

The plunger is adapted to severe at the weakened section 43 if an excessive force is applied to the plunger in an endeavour to overcome the resistance afforded by the disc.

At the end of the injection procedure the syringe is returned to the protective sheath 19 for disposal. When the syringe is in the protective sheath, the needle (which may be contaminated) is not exposed for inadvertent puncturing of the patient or any person handling the syringe.

It should be appreciated that the scope of the invention is not limited to the scope of the embodiment described.

THE CLAIMS defining the invention are as follows:

1. A syringe comprising a barrel, a plunger slidably and sealingly mounted in the barrel and a control means provided on the plunger and co-operating with the barrel to permit movement of the plunger along the barrel in one direction while resisting movement in the reverse direction.

2. A syringe according to Claim 1 wherein said control means includes a portion which is arranged to brush against the barrel upon movement of the plunger in one direction to permit such movement and which is arranged to bite against said barrel upon attempted movement of the plunger in the reverse direction thereby to resist such movement.

3. A syringe according to Claim 1 or 2 wherein said control means comprises a body mounted on the plunger and extending outwardly and axially whereby the outermost portion of the body faces in the direction in which movement of the plunger is resisted.

4. A syringe according to Claim 3 wherein at least said outermost portion of the body is resiliently flexible and is arranged for elastic expansion in a radial direction for pressing engagement with said barrel.

5. A syringe according to Claim 3 or 4 wherein substantially the whole of said body is resiliently flexible.

6. A syringe according to any one of the preceding claims wherein said plunger has a weakened section which is adapted to fracture when excessive force is applied to

the plunger in an attempt to overcome said resistance to movement.

7. A syringe according to any one of the preceding claims wherein said control means is received in a bore within said barrel and the outer portion of said body engages the circumference of said bore.

8. A syringe according to Claim 7 wherein said body is configured in the form of a cup when in said bore.

9. A syringe comprising a barrel, a plunger slidably and sealingly mounted in the barrel and control means provided on the plunger and co-operating with the barrel, the control means having first and second modes of operation wherein in said first mode the control means permits movement of the plunger along the barrel in a first direction while resisting movement in a second direction and wherein in said second mode the control means permits movement of the plunger along the barrel in said second direction while resisting movement in said first direction.

10. A syringe according to Claim 9 wherein said control means includes a portion which is arranged to bite against the barrel when providing resistance to movement of the plunger along the barrel and to brush along the barrel when permitting movement of the plunger.

11. A syringe according to Claim 9 or 10 wherein said control means co-operates with a bore provided in the barrel.

12. A syringe according to Claim 11 wherein said bore is the bore in the barrel in which the piston of the plunger is received.

13. A syringe according to any one of claims 9 to 12 wherein said control means comprises a body mounted on the plunger and having an outer portion arranged for pressing engagement with the barrel, the body being arranged for and capable of selective movement between a first position corresponding to the first mode of operation of the control means in which the body extends towards a first end of the plunger and a second position corresponding to the second mode of operation of the control means in which the body extends towards a second end of the plunger.

14. A syringe according to Claim 13 wherein said body comprises a disc of resiliently flexible material, said disc being of larger diameter than the diameter of the bore whereby the disc is deformed when in the bore to assume a cup-like configuration.

15. A syringe according to Claim 13 or 14 said body is so positioned on the plunger as to move outside the confines of the bore when the plunger is fully retracted thereby to no longer be subjected to deformation by the bore.

16. A syringe according to Claim 13, 14 or 15 wherein the end of the bore through which the body moves into and out of the bore presents an abutment for engagement by the body as it enters the bore thereby to effect deformation of the body, said deformation being such that the outer side of the body is at the trailing end of the body as it moves inwardly along the barrel with the plunger.

17. A syringe according to Claim 13, 14, 15 or 16 wherein the barrel includes a further bore at the outer end of the first-mentioned bore, said further bore being of larger diameter than the first-mentioned bore and the junction between said bores providing said abutment.

18. A syringe according to any one of claims 9 to 17 wherein said plunger includes a weakened section which is adapted to fracture if excessive force is applied to the plungers in an attempt to overcome said resistance to movement.

19. A syringe according to Claim 18 wherein the plunger comprises a piston and a shank extending outwardly of the barrel, said control means being mounted on the shank and said weakened section being provided between the free end of the shank and the control means.

20. A syringe substantially as herein described with reference to the accompanying drawings.

AMENDED CLAIMS

[received by the International Bureau on 19 July 1989 (19.07.89); original claim 6 cancelled; claims 1 amended; other claims unchanged(1 page)]

1. (Amended) A syringe comprising a barrel, a plunger slidably and sealingly mounted in the barrel and a control means provided on the plunger and co-operating with the barrel to permit movement of the plunger along the barrel in one direction while resisting movement in the reverse direction, wherein said plunger has a weakened section which is adapted to fracture in tension when excessive force is applied to the plunger in an attempt to overcome said resistance to movement.

2. A syringe according to Claim 1 wherein said control means includes a portion which is arranged to brush against the barrel upon movement of the plunger in one direction to permit such movement and which is arranged to bite against said barrel upon attempted movement of the plunger in the reverse direction thereby to resist such movement.

3. A syringe according to Claim 1 or 2 wherein said control means comprises a body mounted on the plunger and extending outwardly and axially whereby the outermost portion of the body faces in the direction in which movement of the plunger is resisted.

4. A syringe according to Claim 3 wherein at least said outermost portion of the body is resiliently flexible and is arranged for elastic expansion in a radial direction for pressing engagement with said barrel.

5. A syringe according to Claim 3 or 4 wherein substantially the whole of said body is resiliently flexible.

6. (Cancelled)

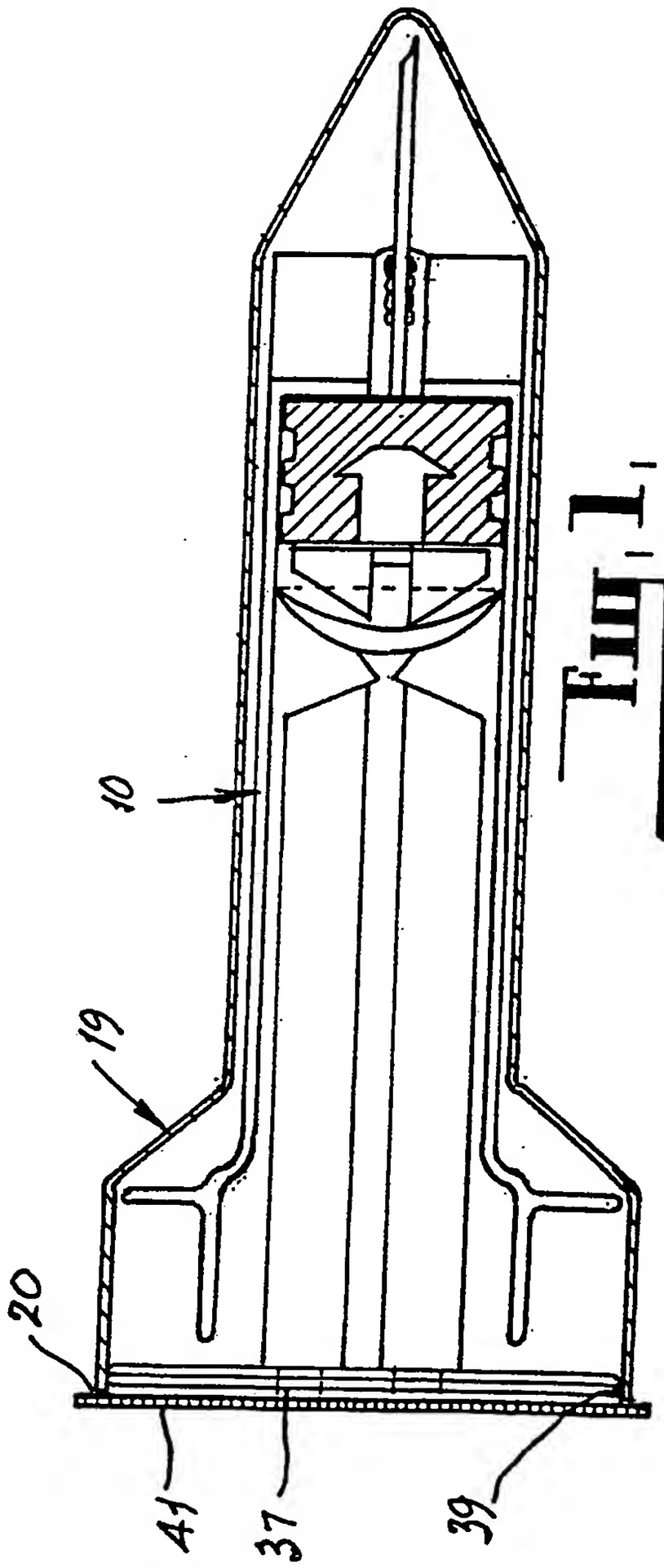
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Fig. 1

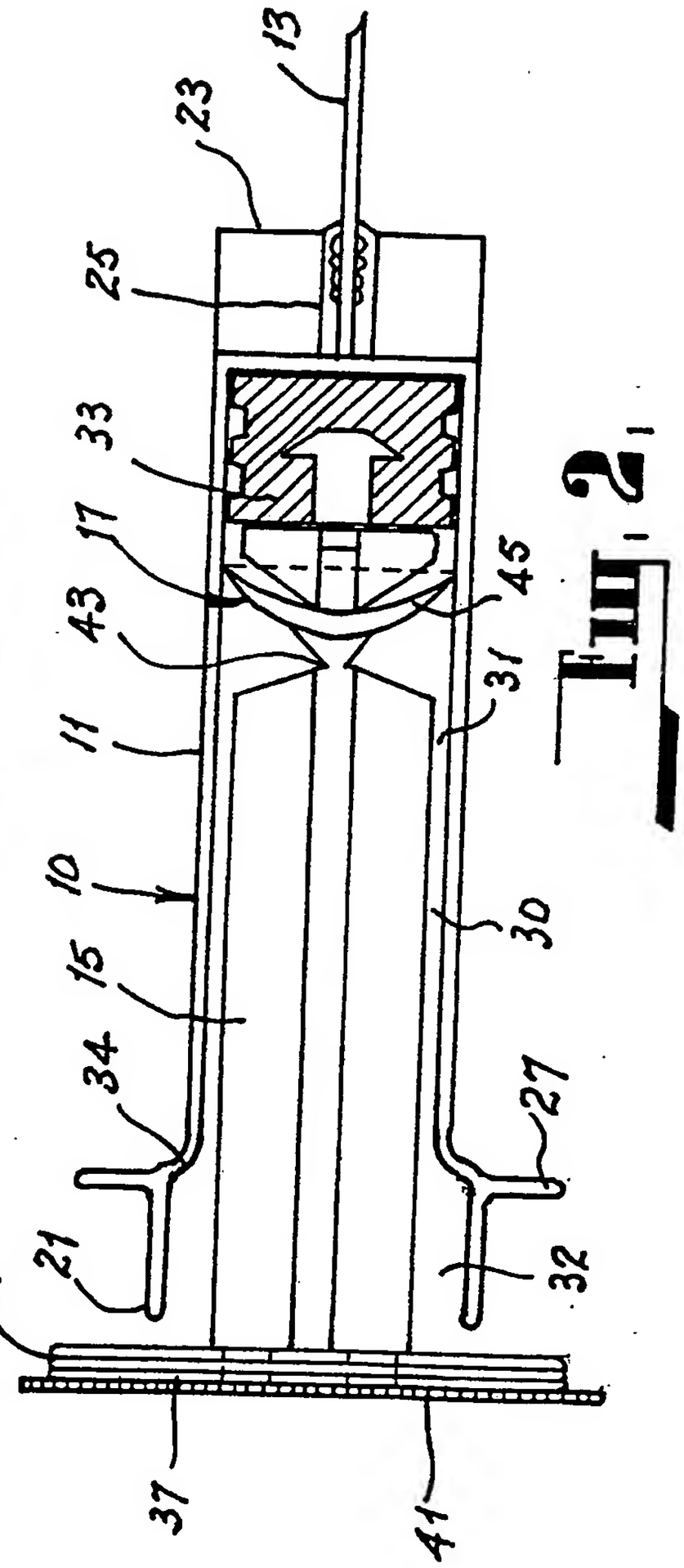
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Fig. 2

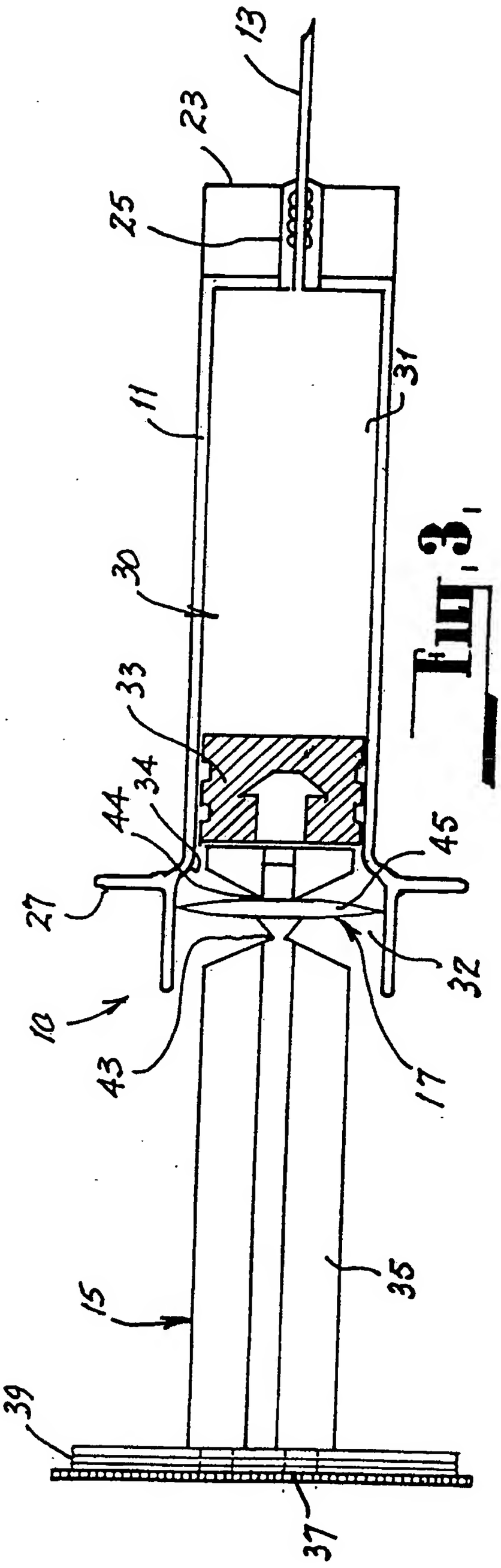
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Fig. 3.

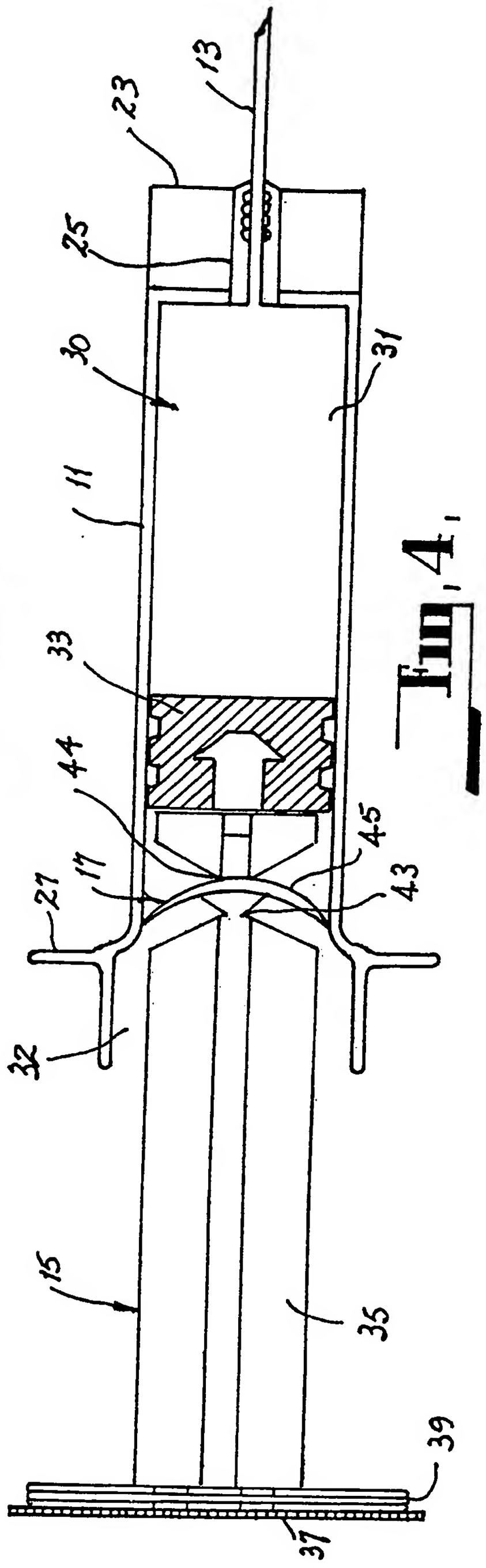
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Fig. 4.

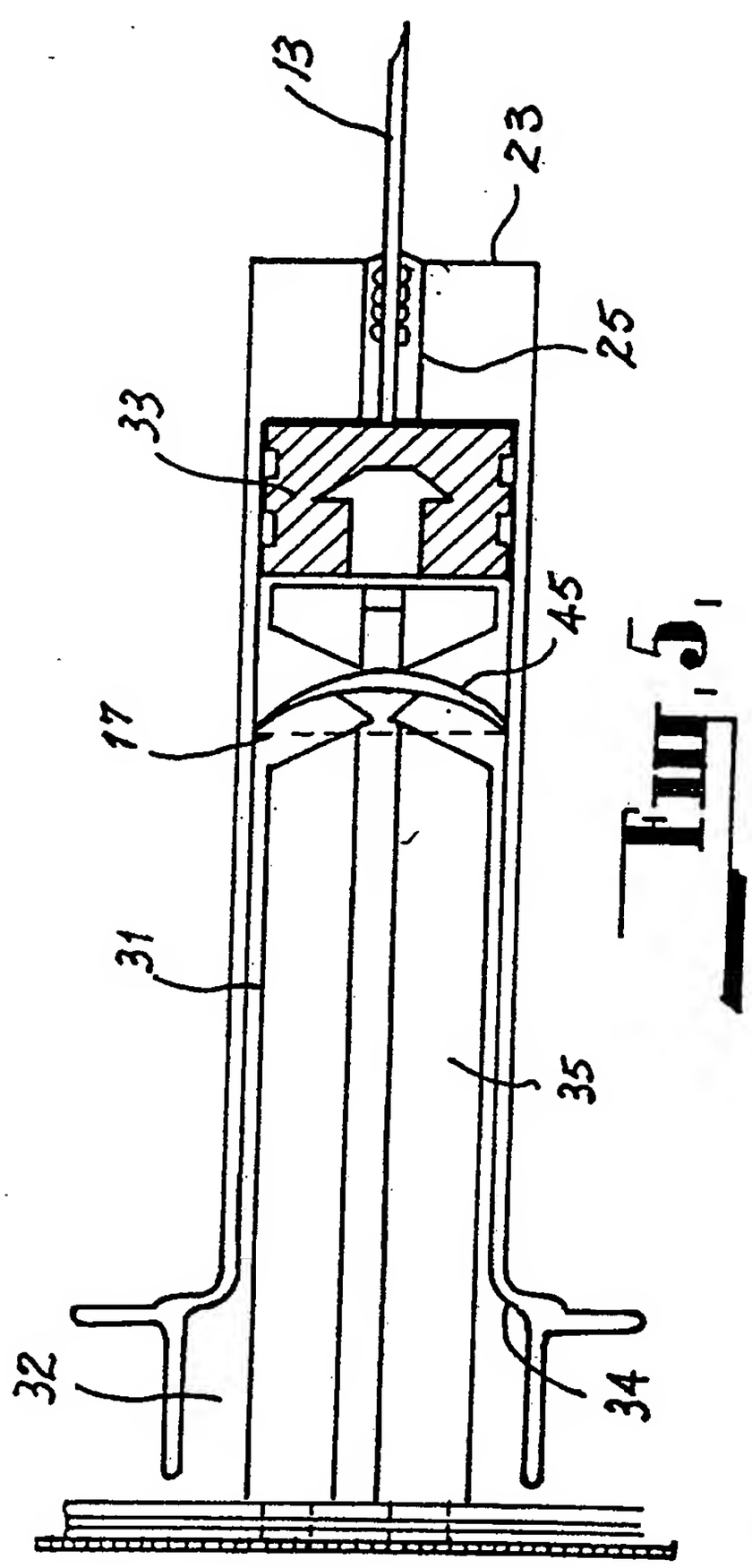

Fig. 5

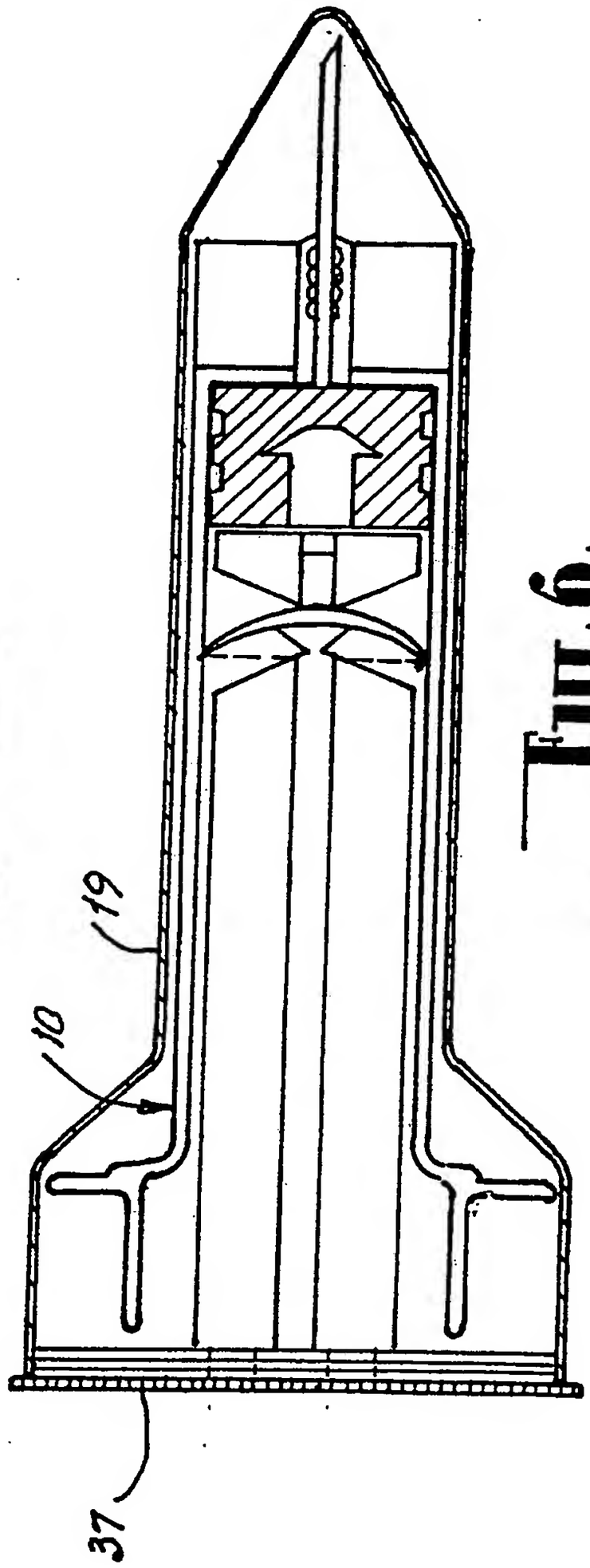

Fig. 6

INTERNATIONAL SEARCH REPORT

International Application No PCT/AU 89/00116

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.[4] A61M 5/315

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[4]	A61M 5/315, 5/31

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

AU : IPC as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	FR,A, 2181580 (STAMPFLI) 7 December 1973 (07.12.73) whole document	(1-20)
A	AU,A, 67176/87 (SANDSDALEN) 9 July 1987 (09.07.87)	(1-20)

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
19 May 1989 (19.05.89)	25 May 1989 (25.05.89)
International Searching Authority	**Signature of Authorized Officer**
Australian Patent Office	A. HENDRICKSON

Form PCT/ISA/210 (second sheet) (January 1985)